SOP-19

Sediment Sampling

Yerington Mine Site
Standard Operating Procedure

Revision 0
Revision Date: May 15, 2007

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SEDIMENT SAMPLING

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1.0 OBJECTIVES

The objective of this standard operating procedure is to provide standardized methods for the field collection of surface sediment samples using trowel, scoop, bucket auger, or tube auger techniques.

2.0 SCOPE AND APPLICABILITY

This procedure specifies the methods to be followed by the field personnel for the collection of surface sediment samples. The collection techniques and equipment selected are dependent on the depth of the aqueous layer, the type of aqueous layer (flowing vs. standing water), the type of sample required (disturbed vs. undisturbed), contaminants present, and sediment type.

Sediment samples may be used to determine the physical, hydrogeologic, and chemical properties of site sediment. Analytical data aid in the characterization of the site, identification of hazardous substance source areas, and determination of the nature and extent of contamination. Proper sampling techniques, proper selection of sampling equipment, and proper decontamination procedures as outlined in the project Work Plan allows for collection of a representative sample and reduces the risk cross-contamination.

Detailed records will be maintained during sampling activities, particularly with respect to location, depth, color, odor, lithology, hydrogeologic characteristics, and readings derived from field monitoring equipment. These records will be prepared following as required by SOP-03 "Field Notes and Documentation".

3.0 RESPONSIBILITES

The *Project Manager* is responsible for ensuring that groundwater measurements are implemented in accordance with this SOP and any other site-specific or project specific planning documents.

The *Field Personnel* are responsible for understanding and implementing this SOP during all field activities, as well as obtaining the appropriate field logbooks, forms and records necessary to complete the field activities.

The *Site Safety Officer (SSO)*, typically the supervising field manager, is responsible for overseeing the health and safety of employees and for stopping work if necessary to fix unsafe conditions observed in the field.

4.0 DEFINITIONS

Surface Sediment - Generally considered to be the top 6 inches of a sediment layer (i.e., soil from 0-to-6-inches below sediments surface).

Shallow Aqueous Layer – is generally considered to range from 0 to 10 feet below water surface.

5.0 REQUIRED MATERIALS

Equipment used during manual collection of surface or subsurface sediment samples may include a wide variety of tools depending upon the type of sampling and methods being used. This equipment can include, but is not limited to the following:

- Maps/plot plan
- Safety equipment and personal protective equipment
- Tape measure
- Logbook
- Chain of Custody records
- Sample containers and labels
- Cooler(s) and ice
- Decontamination supplies
- Wading boots, hip waders
- Boat
- Marking stakes or flags
- Sampling tool (e.g. spade/shovel, scoop, trowel, corer, bucket auger, tube auger)
- "T" Handle with extension rods

6.0 PROCEDURES

This section identifies important preparations that should be made before initiating a sediment sampling event and describes the steps that should be followed during sediment sample collection at environmental sites.

6.1 Preparation for Soil Sample Collection

Preparation for the field collection of sediment samples shall commence with an assessment of aqueous layer conditions, if an aqueous layer exisits, (e.g., standing vs flowing water) and depth of the aqueous layer.

If a point designated for sediment sample collection is located under a deep aqueous layer (i.e. too deep to wade in) a boat may be implemented to reach the collection location. It may also be necessary to clear the area of underwater plants or submerged braches and debris. Prior to field collection of sediment samples, the Project Manager (PM), Task Manager (as appropriate), and field personnel shall also perform the following tasks.

- Conduct a general site reconnaissance in accordance with the site-specific safety and health plan.
- Prepare all field forms as appropriate (field logbooks, pre-prepared Chain of Custody records and labels, etc.)

- Determine required monitoring equipment (e.g., radiation meter) and personal protective equipment (PPE) required for the health and safety of personnel.
- Perform an underground utility clearance of all staked sampling locations prior to excavating or drilling.

6.2 Sampling Methods

The following sections describe the specific steps that the environmental engineer/geologist shall follow when collecting sediment samples if no aqueous layer is covering the sediment.

6.2.2 Trowel or Scoop

The trowel or scoop method is appropriate only with surface sediments from 0 to 6 inches which are dry or covered with a shallow (0 to 12 inches) non-flowing or gently flowing aqueous layer. Deep or rapidly flowing water renders this method less accurate than those listed below due to potential loss of solids. A stainless steel or plastic sampling implement will suffice in most applications. Do not use common garden trowels that are plated with chrome or other materials. The following procedure will be used to collect sediment with a scoop, shovel, or trowel:

1) Clear the area to be sampled of any surface debris.
2) Using a decontaminated sampling implement, remove the desired thickness and volume of sediment from the sampling area.
3) Transfer the sample into an appropriate sample or homogenization container. Samples being analyzed for volatile constituents should not be homogenized or agitated in any way prior to placement in the sample container. Ensure that non-dedicated containers have been adequately decontaminated.
4) Surface water should be decanted from the sample or homogenization container prior to sealing or transfer; care should be taken to retain the fine sediment fraction during this procedure.

6.2.3 Bucket Auger or Tube Auger

Collection of surface sediment from beneath a shallow aqueous layer can be accomplished with a system consisting of bucket auger or tube auger, a series of extensions, and a "T" handle. The use of additional extensions in conjunction with a bucket auger can increase the depth of water from which sediment can be colleted from 24 inches to 10 feet of more. However, sample handling and manipulation increases in difficulty with increasing depth of water. The bucket auger or tube auger is driven into the sediment and used to extract a core. If multiple cores are collected the samples shall be homogenized prior to placing in the sample container.

Tube Auger

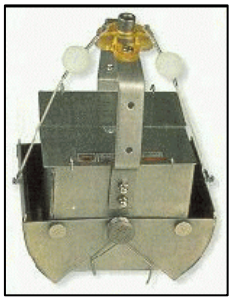
Bucket Auger

The flowing procedure will be used to collect sediment samples with a bucket auger or tube auger:

1) Don clean disposable nitrile or latex surgical gloves to prevent cross-contamination and to provide personal protection. New gloves should be donned for sample collection at each new location or whenever gloves are torn or otherwise compromised.
2) Attach the auger bit to drill rod extensions (depth dependent), and attach the T-handle to the drill rod. An acetate core may be inserted into the bucket auger or tube auger prior to sampling if characteristics of the sediments warrant. By using this technique, an intact core can be extracted.
3) Clear the area to be sampled of any surface debris.
4) Insert the bucket auger or tube auger into the sediment at a 0º to 20º angle from vertical. This orientation minimizes spillage of the sample from the sampler upon extraction from the sediment.
5) Rotate the auger to cut a core of sediment.
6) Slowly withdraw the auger; if using a tube auger, make sure that the slot is facing upward.
7) Transfer the sample or a specified aliquot of sample into an appropriate sample or homogenization container. Samples being analyzed for volatile constituents should not be homogenized or agitated in any way prior to placement in the sample container. Ensure that non-dedicated containers have been adequately decontaminated.

6.2.4 Dredge

Collection of surface sediment can be accomplished with a system consisting of a remotely activated device (dredge) and a deployment system. This technique consists of lowering a sampling device (dredge) to the surface of the sediment by use of a rope, cable, or extended handle. The mechanism is activated, and the device entraps sediment in spring loaded or lever operated jaws. An Ekman dredge is a lightweight sediment sampling device with spring activated jaws. It is used to collect moderately consolidated, fine textured sediment. The following procedure will be used for collecting sediment with an Ekman dredge:



Dredge

1) Attach a sturdy nylon rope or stainless steel cable through the hole on the top of the bracket, or secure the extension handle to the bracket with machine bolts.
2) Attach springs to both sides of the jaws. Fix the jaws so that they are in open position by placing trip cables over the release studs. Ensure that the hinged doors on the dredge top are free to open.
3) Lower the sampler to a point 4 to 6 inches above the sediment surface.

4) Drop the sampler to the sediment.

5) Trigger the jaw release mechanism by lowering a messenger down the line, or by depressing the button on the upper end of the extension handle.

6) Raise the sampler and slowly decant any free liquid through the top of the sampler. Care should be taken to retain the fine sediment fraction during this procedure.

7) Open the dredge jaws and transfer the sample into a stainless steel, plastic or other depressing the button on the upper end of the should be taken to retain the fine sediment appropriate composition (e.g., Teflon) container. Ensure that non-dedicated containers have been adequately decontaminated. If necessary, continue to collect additional sediment grabs until sufficient material has been secured to fulfill analytical requirements. Thoroughly homogenize and then transfer sediment to sample containers appropriate for the analyses requested. Samples for volatile organic analysis must be collected directly from the bucket before homogenization to minimize volatilization of contaminants.

6.3 Decontamination

Prior to and after each sampling event, all sampling equipment must be thoroughly decontaminated following the methods outlined below and in SOP-05 *Equipment Decontamination*. The primary purpose of equipment decontamination is to prevent the potential of cross-contamination within the samples collected.

Because decontamination procedures are time consuming, having a quantity of sampling tools available is recommended. If surface water samples are collected using the direct method, decontamination is not required as shared sampling equipment does not come into contact with the water sample and new sampling containers are used at each sampling location. For other collection techniques, all sampling equipment must be decontaminated prior to reuse. Equipment decontamination will consist of the following 5 steps:

1) Non-phosphate detergent wash (e.g. Liquinox)

2) Tap water rinse

3) 2% nitric acid rinse (diluted with deionized water)

4) Deionized water triple rinse

5) Air Dry

7.0 QUALITY ASSURANCE/QUALITY CONTROL

Quality assurance activities which apply to the implementation of these procedures are located in the site QAPP, including the collection of required quality control samples such as field duplicates, field blanks and equipment blanks. In addition, the following general procedures apply:

- All data must be documented on field data sheets or within site logbooks.
- All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified in the work plan. Equipment calibration activities must occur prior to sampling/operation and they must be documented.

Descriptions of any deviations and the reason for deviations from the site QAPP or this SOP should be noted in the field notebook, as necessary. In addition, the logbook should track pertinent sample collection information such as:

- Sample date/time;
- Personnel;
- Weather conditions;
- Sample identification information; and
- Visible staining or other indications of non-homogeneous conditions.

8.0 REFERENCES

None

9.0 ATTACHMENTS

None